15 Formulas

Much of the real estate math that will be encountered will involve math formulas of one type or another. Therefore, we will review some principles that will prepare the student to solve these types of math formulas.

To begin, let us use one fairly easy math example:

EXAMPLE: If a house sold for $410,000 and the real estate commission is 6% of the sell price, what was the amount of the commission?

FORMULA:

$$Sell\ Price \times Rate = Commission$$
$$\$410,000 \times .06 = ?$$
$$\$410,000 \times .06 = \$24,600$$

To solve this type of problem, we need to know two things before we can proceed to solve for the third. Most people do not have too much difficulty understanding the type of problem shown above, i.e., the sell price and rate are known and we must solve for the commission. The confusion begins to arise when the thing we do not know and must solve for is the sell price or the rate.

EXAMPLE: What did a house sell for if the REALTOR® received a $24,600 commission and the commission rate was 6% of the sell price?

EXAMPLE: What was the rate of commission charged if a house sold for $410,000 and the broker received a $24,600 commission?

Instead of memorizing two new formulas,

$$Sell\ Price = \frac{Commission}{Rate} \quad and \quad Rate = \frac{Commission}{Sell\ Price}$$

There is a Formula Aid that can be used to help set up the problem and indicate what math step needs to be taken.

Start with the original formula:
Sell Price × Rate = Commission

If we show the Aid as:

AID
$$\frac{C}{SP \times R}$$

we can be given any two bits of information and tell what to do to get the third.

Let us take each of the three possible situations and see how the Aid would indicate what step to take.

SITUATION 1:   Sell Price = $410,000

Rate = .06   AID $$\boxed{\dfrac{C}{SP \times R}}$$

Commission = ?

If we cover the term we are solving for (commission), the aid will indicate what step to take with the other two.

AID $$\boxed{\dfrac{\quad}{SP \times R}}$$ = $410,000 X .06 = $24,600

SITUATION 2:   Sell Price = $410,000

Rate = ?   AID $$\boxed{\dfrac{C}{SP \times R}}$$

Commission = $24,600

If we cover the term we are solving for (rate), the Aid will indicate what step to take with the other two.

$$\boxed{\dfrac{C}{SP}} = \dfrac{\$24,600}{\$410,000} = .06 = 6\%$$

AID

SITUATION 3:   Sell Price = ?

Rate = .06   AID $$\boxed{\dfrac{C}{SP \times R}}$$

Commission = $24,600

If we cover the term we are solving for (sell price), the Aid will indicate what step to take with the other two.

AID $$\boxed{\dfrac{C}{R}} = \dfrac{\$24,600}{.06} = \$410,000$$

This approach can be taken with any formula in solving real estate math problems. The following table shows some of the more common formulas used in solving real estate math problems and the corresponding Aid for each formula.

Table of Formula Aids

Formula		Aid
Length × Width = Area	L × W = A	$\dfrac{A}{L \times W}$
Principal × Rate × Time = Interest	P × R × T = I	$\dfrac{I}{P \times R \times T}$
Base × Rate = Percentage	B × R = P	$\dfrac{P}{B \times R}$
*Sell Price × Rate = Commission	SP × R = C	$\dfrac{C}{SP \times R}$
*Amount × Rate = Interest	A × R = I	$\dfrac{I}{A \times R}$
*Appraised Value × Assessment Rate = Assessed Value	AppV × AssR = AssV	$\dfrac{AssV}{AppV \times AssR}$
*Assessed Value × Tax Rate = Annual Tax	AssV × TR = Tax	$\dfrac{Tax}{AssV \times TR}$
*Cost × Depreciation Rate = Depreciation	C × R = D	$\dfrac{D}{C \times R}$
*Investment × Rate of Profit = Profit	I × R = P	$\dfrac{P}{I \times R}$
*Investment × Rate of Loss = Loss	I × R = L	$\dfrac{L}{I \times R}$
*Investment × Rate of Return = Net Income	I × R = NI	$\dfrac{NI}{I \times R}$
*Value × Capitalization Rate = Net Income	V × CR = NI	$\dfrac{NI}{V \times CR}$

*Note: These formulas are variations of the basic formula: B × R = P.

Acreage

An **acre** is a measurement that deals with area. An acre contains 43,560 square feet.

To convert square footage into acres, all that is necessary is to divide that subject land area by 43,560 square feet.

EXAMPLE: A lot contains 24,100 square feet. What is the acreage?

$$24,100 \div 43,560 = .55 \text{ (approximately)}$$

EXAMPLE: How many acres are in a lot that contains 96,423 sq. ft.?

$$96,423 \div 43,560 = 2.2 \text{ (approximately)}$$

To convert acres to square feet, multiply the acreage times 43,560 square feet.

EXAMPLE: How many square feet does a lot containing 1.75 acres contain?

$$43,560 \times 1.75 = 76,230 \text{ sq. ft.}$$

EXAMPLE: A lot contains one third of an acre. What is the square footage of the lot?

$$43,560 \times \frac{1}{3} = \frac{43,560}{3} = 14,520 \text{ sq. ft.}$$

NOTE: As with any math problem, the fraction or decimal equivalent may be used. The use of either will be dictated by what is asked for in the question, the type of problem being done, or ease and accuracy of the student.

Volume

In the area problems we have dealt with, we have had two dimensions and expressed the results in square measure (i.e., square inches, square feet, square yards, etc.). Now we will deal with three dimensions in calculating volume. Volume is expressed in cubic measure (e.g., inches times inches times inches equals cubic inches). As in the area problems, all measurements should be in the same unit (feet times feet times feet rather than inches times feet times feet)

16 Interest

As a part of providing mortgage guidance and counseling, the real estate broker and salesperson should be able to perform math calculations relating to interest.

The basic formula that will be used in solving interest problems is as follows:

Principal × Rate × Time = Interest

$$P \times R \times T = I$$

The following terms should be understood:

Principal - the amount borrowed or loaned (e.g., $1,000 loan)
Rate - the percent charged for use of the money (e.g., 8% or .08)
Time - duration (in years) of the loan (e.g., 1 year)
Interest - the charge for the use of the principal (e.g., P × R × T)

EXAMPLE:

$$P \times R \times T = I$$

$$\$1,000 \times .08 \times 1 = \$80.00$$

In dealing with interest math, let us first work with loans of one-year duration and then move on to the more complicated calculation for loans that are not one even year.

One-Year Loans

As we noted in the earlier chapter on formulas, the interest formula P × R × T = I converts to the Formula Aid:

$$AID \quad \boxed{\dfrac{I}{P \times R \times T}}$$

This AID will be used for all interest calculations. In approaching any of the following problems, the student should:

1)   List the parts to the formula - P,R,T, and I
2)   Fill in the information available
3)   Set up the formula using the AID
4)   Solve the problem

Solve for Interest

EXAMPLE: What is the interest due on $5,000 borrowed at 8% for 1 year:

Principal = $5,000

Rate = .08

Time = 1

Interest = ?

AID $\dfrac{I}{P \times R \times T}$

The AID indicates:

$$P \times R \times T = 5,000 \times .08 \times 1 = \$400 \text{ in Interest}$$

PROBLEM: 1) What interest will be due on $10,000 loan at 9% for 1 year?

Solve for Rate

EXAMPLE: What was the interest rate charged if a $12,000 loan yielded $720 in interest after one year?

Principal = $12,000

Rate = ?

Time = 1

Interest = $720

AID $\dfrac{I}{P \times R \times T}$

The AID indicates:

$$\frac{I}{P \times T} = \frac{720}{12,000 \times 1} = \frac{72}{12,000} = \frac{9}{150} = \frac{3}{50} = 50\overline{)3.00}^{.06} = 6\% \text{ Rate}$$

16-2 Interest

PROBLEM: 2)   At the end of one year, a $5,000 bank account had earned $250.
What rate of interest was the bank paying?

Solve for Principal

EXAMPLE: How much should be invested at 11% interest to earn $385 after 1 year?

Principal = ?

Rate = .11

Time = 1

$$\text{AID} \quad \boxed{\dfrac{I}{P \times R \times T}}$$

Interest = $385

The AID indicates:

$$\frac{I}{R \times T} = \frac{385}{.11 \times 1} = \frac{385}{.11} = .11\overline{)385.00}^{\;3500.} = \$3{,}500 \text{ Principal}$$

$$\begin{array}{r} 33 \\ \hline 55 \\ 55 \\ \hline 0 \end{array}$$

PROBLEM: 3)   What was the amount borrowed at 8% interest if $560 is
due in interest after 1 year?

Solve For Rate

EXAMPLE: What interest rate was charged if an $18,000 loan returned
$19,440 principal and interest after 1 year?

Principal = $18,000

Rate = ?

Time = 1

$$\text{AID} \quad \boxed{\dfrac{I}{P \times R \times T}}$$

Interest = $1,440

The AID indicates:

$$\frac{I}{P \times T} = \frac{1,440}{18,000 \times 1} = \frac{1,440}{18,000} = \frac{36}{450} = \frac{18}{225} = 225)\overline{18.00}^{.08} = 8\%\ \text{Rate}$$

PROBLEM: 4) If $4,000 put in the bank for 1 year grew to $4,280, what interest rate was paid?

Non-One-Year Loans

Now that we have dealt with interest problems where time was one year (T = 1), let us look at situations where time is either less than a year or more than a year and therefore becomes a factor in solving the problem. (Time must be shown as a part of a year: 6 months = 1/2 or .5).

Solve For Interest

EXAMPLE: What is the interest on $30,000 borrowed at 9% interest for 2 years?

Principal = $30,000

Rate = .09

Time = 2

Interest = ?

AID $\boxed{\dfrac{I}{P \times R \times T}}$

The AID indicates:

$$P \times R \times T = 30,000 \times .09 \times 2 = 2,700 \times 2 = \$5,400\ \text{Interest}$$

PROBLEM: 5) What interest will $2,000 earn if put in the bank for 3 years at 6% interest?

Solve For Rate

EXAMPLE: At what rate does $20,000 have to be in the bank to earn $800 in 6 months?

Principal = $20,000

Rate = ?

AID $\boxed{\dfrac{I}{P \times R \times T}}$

Time = .5
    (Show time as part of a year)
Interest = $800

The AID indicates:

$$\frac{I}{P \times T} = \frac{800}{20,000 \times .5} = \frac{800}{10,000} = .08 \text{ or } 8\% \text{ Rate}$$

PROBLEM: 6)   A $4,000 loan cost $70 in interest after 3 months. What was the interest rate?

Solve For Principal

EXAMPLE: How much was borrowed if the interest at 8% came to $384   in 18 months?

Principal = ?

Rate = .08

AID $\boxed{\dfrac{I}{P \times R \times T}}$

Time = 1.5

Interest = $384

The AID indicates:

$$\frac{I}{R \times T} = \frac{384}{.08 \times 1.5} = \frac{384}{.12} = .12\overline{)384.00} = \$3,200 \text{ Principal}$$

$$\begin{array}{r} 3200 \\ .12\overline{)384.00} \\ 36 \\ \hline 24 \\ 24 \\ \hline 0 \end{array}$$

PROBLEM 7) How much was put in the bank if after 2 months at $8\frac{1}{2}\%$ the interest amounted to $68?

Daily Interest Problems

Often money is not borrowed or loaned in neat time packages of years or even months. So we must deal with interest calculations for so many days. (For interest calculations, use 360 days in a year and 30 days in a month.)

The general approach for this type of problem is:
1) Calculate the yearly interest by the methods used previously.
2) Divide by 12 to get monthly interest.
3) Divide by 30 to get daily interest.

Now we can multiply these amounts by the number of years, months, and days the money was borrowed for and add them together to get the total interest.

EXAMPLE: What is the interest on $2,000 borrowed at 8% for 5 days?

$$\text{AID} \quad \boxed{\dfrac{I}{P \times R \times T}}$$

Annual Interest = $2,000 X .08	= $160 / year	
Monthly Interest = 160 ÷ 12	= $13.333 / mo.	
Daily Interest = 13.33 ÷ 30	= $.444 / day	
Interest for 5 days = $.444 X 5	= $2.22	

Note: Math should be carried to three decimal places until the answer is reached, and then rounded off to two places.

PROBLEM: 8) What interest is due on $3,500 borrowed for 14 days at 9%?

EXAMPLE: What is the interest on $3,000 at 7% for 1 year, 8 months and 10 days?

$$\text{AID} \quad \boxed{\dfrac{I}{P \times R \times T}}$$

Annual Interest = $3,000 X .07   = 210 X 1   = $210.00
Monthly Interest =   210 ÷ 12   = 17.50 X 8   = $140.00
Daily Interest =   17.50 ÷ 30   = .583 X 10   = $5.83
Total Interest = $355.83

PROBLEM   9)   What is the interest charge if $4,000 borrowed at 11% for 2 years, 3 months and 21 days?

EXAMPLE: What is the interest on $4,000 borrowed at 6% from February 15, 2017 to June 22, 2020?

Elapsed Time of Loan =	Year	Month	Day
	2020	6	22
-	2017	2	15
	3	4	7

= 3 years, 4 months, 7 days

$$\text{AID} \quad \boxed{\dfrac{I}{P \times R \times T}}$$

Annual Interest = $4,000 X .06   = $240 X 3   = $720.00
Monthly Interest =   240 ÷ 12   = 20.00 X 4   = $ 80.00
Daily Interest =   20.00 ÷ 30   = .667 X 7   = $ 4.67
Total Interest = $804.67

PROBLEM: 10) What is the interest on $8,000 borrowed at 12 % interest from April 10, 2017 to August 20, 2019?

EXAMPLE: What is the interest charge on $2,400 borrowed at 10% interest from October 20, 2016 to December 10, 2019?

Borrowed one month

Elapsed Time of Loan =	Year	Month	Day
	2019	~~12~~ 11	~~10~~ 40
-	2016	10	20
	3	1	20

= 3 years, 1 month, 20 days

AID $$\frac{I}{P \times R \times T}$$

Annual Interest = $2,400 X .10 = $240 X 3 = $720.00
Monthly Interest = 240 ÷ 12 = 20.00 X 1 = $ 20.00
Daily Interest = 20.00 ÷ 30 = .667 X 20 = $ 13.34
Total Interest = $753.34

PROBLEM: 11) What is the interest on $3,300 borrowed at $8\frac{1}{2}$% from September 16, 2016 to June 12, 2022?

Amortization

Amortization can be defined as the systematic liquidation of a debt. As mentioned in Chapter 7 the direct reduction mortgage is by far the most common type of amortization method for residential real estate. This math chapter has used the simple interest method for calculations but, the direct reduction method is based on a compound interest formula. For our purposes we do not need to know the formula since there are tables, books, and some calculators that can be used to compute the monthly principal and interest payment (refer to the bottom of the last page of Chapter 7 for an abbreviated table).

In this section we will illustrate how the amount of interest versus principal changes in relation to the constant monthly payment using the simple interest formula. For our example let's assume we have entered into a loan agreement for $100,000.00 at 9% for 30 years. Using the table at the end of Chapter 7 we find at the intersecting point for 30 years and 9% the figure $8.05. This means for every $1,000.00 borrowed you will have to pay back $8.05 for the next 30 years. In this example we have borrowed $100,000.00 therefore, 100 multiplied by $8.05 per month gives us a constant monthly payment of $805.00 to repay the principal and interest on this note. Remember this payment remains the same for the whole 30 years or 360 months.

To compute the total interest to be paid over the term of the note just multiply the monthly payment by the number of months of the note and then subtract the original principal amount. In this example the total interest would be:

$$\$805 \times 360 \text{ mos.} = \$289{,}800 \quad \text{Total of monthly payments}$$
$$\underline{- 100{,}000} \quad \text{Original principal balance}$$
$$\$189{,}800 \quad \text{Total interest}$$

Most people are amazed with the amount of interest that is paid throughout the life of the typical direct reduction note.

It is also interesting to see how the interest and principal change in relation to the constant monthly payment. Using the figures from our example we can follow the payments for the first three months of this note using the simple interest formula:

1st Month: $\$100{,}000 \times .09 \times \dfrac{1}{12} = \$750$ Interest for first month

$805 Payment (P&I Constant) - $750 = $55 Towards principal

Therefore, the principal balance for month #2 is
$100,000 - $55 = $99,945

2nd Month: $\$99{,}945 \times .09 \times \dfrac{1}{12} = \$749.59$ Interest for second month

$805 Payment - $749.59 = $55.41 Towards principal

Principal balance for month #3 is
$99,945 - $55.41 = $99,889.59

3rd Month: $\$99{,}889.59 \times .09 \times \dfrac{1}{12} = \$749.17$ Interest for third month

$805 Payment - $749.17 = $55.83 Towards principal

Principal balance for month #4 is
$99,889.59 - $55.83 = $99,833.76

If you follow these steps for each monthly payment you'll notice that while the interest is decreasing in each payment the principal reduction is increasing. You will also note that for many years the amount of principal being reduced at the beginning of the note is somewhat insignificant in relation to the total principal.

The ability to be able to use some of these calculations will be helpful when advising your clients. As an example, a buyer asks how much they could save on the preceding note if the term were for 20 instead of 30 years. Try it!

Self-Quiz

1) What interest would $30,000 loaned for 1 year at 8% yield?
2) If a bank loaned $25,000 for 1 year and received $2,250 in interest, what rate was charged?
3) How much would you invest for 1 year at 12 % to yield $2,400 interest?
4) What was the rate of interest if a $40,000 loan for 1 year return a total of $42,400 principal and interest?
5) If $8,000 is put in a bank for 3 years at 8%, what interest would it generate?
6) A $13,000 loan for 6 months at 7% would yield what interest?
7) What rate of interest would be charged for a $16,000 loan to produce $5,760 in interest after 4 years?
8) How much would be invested at 8% for 4 months to yield a $160 interest?
9) What is the interest on a $20,000 loan at 8% for 2 years, 3 months, 10 days?
10) What is the interest on a $7,000 loan at 10% from August 25, 2017 to March 16, 2020.

Answer Key

Problems		Self-Quiz	
1)	$900	1)	$2,400
2)	5%	2)	9%
3)	$7,000	3)	$20,000
4)	7%	4)	6%
5)	$360	5)	$1,920
6)	7%	6)	$455
7)	$4,800	7)	9%
8)	$12.25	8)	$6,000
9)	$1,015.67	9)	$3,644.44
10)	$2,266.67	10)	$1,790.83 or $1,790.82
11)	$1,609.76 or $1,609.75		

17 Profit and Loss

The approach to solving profit and loss math problems is very similar to solving the interest problems in the previous chapter. One thing that is new is ending up with less than we started, as in the case of a loss.

The basic formulas for calculating profit and loss problems are:

Profit

> Investment × Rate (of profit) = Profit
> I × R = P

Loss

> Investment × Rate (of loss) = Loss
> I × R = L

In dealing with either profit or loss calculations, the rates are expressed as a percentage of investment. Thus, if a man invests $4,000 and one year later his investment has grown $1,000 to $5,000, we would say that he has a 25% profit, not 20%. We compare the $1,000 to the original $4,000.

Now, let us deal with profit calculations first and then problems involving loss.

Profit Problems

The profit formula, I × R = P, converts to the AID:

$$\text{AID} \quad \frac{P}{I \times R}$$

We shall use this AID to indicate the appropriate math step to be taken.

Solve For Profit

EXAMPLE: If $200,000 is invested and returns a 10% profit, what is the amount of the profit?

Investment = $200,000

Rate = 10%

Profit = ?

AID $\dfrac{P}{I \times R}$

The Aid indicates:

$I \times R = \$200,000 \times .10 = \$20,000$ Profit

PROBLEMS: 1) If a $360,000 investment realizes a 15% profit after 3 years, what is the amount of the profit?

2) If a house is purchased for $480,000 and sold for a 25% profit, what did it sell for?

Solve For Rate

EXAMPLE: If a piece of property bought for $124,000 sold for a $15,500 profit, what was the rate of profit?

Investment = $124,000

Rate = ?

Profit = $15,500

AID $\dfrac{P}{I \times R}$

The Aid indicates: $\dfrac{P}{I} = \dfrac{15,500}{124,000} = \dfrac{1}{8} = 12.5\%$ Profit

PROBLEMS: 3)   Mrs. Jones paid $270,000 for her house. She sold it for a $90,000
                profit. What was her rate of profit?

4)   Mr. Brown sold his building for $320,000. If he paid $200,000 for
     it what was his rate of profit?

Solve For Investment

EXAMPLE: A piece of land sold for an 8% profit that amounted to $12,800. What was
           the original investment?

Investment = ?

Rate = 8%   AID $$\frac{P}{I \times R}$$

Profit = $12,800

The Aid indicates:

$$\frac{P}{R} = \frac{12,800}{.08} = \$160,000 \text{ Investment}$$

PROBLEMS: 5)   XYZ Corporation sold a building for a 15% profit. The profit was
                $28,500. What did the building cost?

6)   Mr. White sold his building for $255,000, which amounted to a
     20% profit. What did the building cost him?

Note: This type of problem will not fit the normal formula I × R = P. We don't
       know I or P. We need to use a new formula:
       Investment × Rate of Sell Price = Sell Price.

       See if you can develop the Aid using a Rate of S.P. of 120%.

Loss Problems

The treatment of loss problems and the loss formula is very similar to dealing with the profit problems.

The loss formula $I \times R = L$ converts to the formula AID:

AID $$\boxed{\dfrac{L}{I \times R}}$$

We shall use this AID to indicate the appropriate math step to be taken.

Solve For Loss

EXAMPLE: If $120,000 is invested and the investor has a 10% loss, what is the amount of the loss?

Investment = $120,000

Rate = 10%   AID $$\boxed{\dfrac{L}{I \times R}}$$

Loss = ?

The Aid indicates:

$$I \times R = 120{,}000 \times .10 = \$12{,}000 \text{ Loss}$$

PROBLEMS: 7) If a $250,000 investment shows a 15% loss after 2 years, what is the amount of the loss?

8) A three-family house that was purchased for $320,000 had a fire. The owner was not insured. If he sold the house for a 60% loss, what did he sell it for?

Solve for Rate

EXAMPLE: If an acre of land purchased for $90,000 sold at an $18,000 loss, what was the rate of loss?

Investment = $90,000

Rate = ?

AID $\boxed{\dfrac{L}{I \times R}}$

Loss = 18,000

The Aid indicates:

$$\frac{L}{I} = \frac{18,000}{90,000} = 20\% \text{ Loss}$$

PROBLEMS: 9) A group of investors purchased a building for $240,000 and sold it later for a $48,000 loss. What was the rate of loss?

10) Jones sold his summer cottage for $160,000. If he paid $200,000 for it, what was his rate of loss?

Solve For Investment

EXAMPLE: A store sold for a loss of $19,200, which was a 12% loss. What was the original investment?

Investment = ?

Rate = 12%

AID $\boxed{\dfrac{L}{I \times R}}$

Loss = 19,200

The Aid indicates:

$$\frac{L}{R} = \frac{19,200}{.12} = \$160,000 \text{ Original Investment}$$

PROBLEMS: 11) A piece of property that was foreclosed sold at a 6% loss. If that loss amounted to $11,400, what did the owner originally pay for the property?

12) Two business partners sold their building for $198,000 which amounted to a 10% loss. What did the building cost them originally?

Note: This type of problem will not fit the normal formula I × R = L. We don't know I or L. We need to use a new formula:

Investment × Rate of Sell Price = Sell Price.

See if you can develop the AID using a Rate of S.P. of 90%.

Self-Quiz

1) A builder constructs a house for $130,000 and sells it at a 16% profit. What was his profit?

2) If a speculator sold an investment for $168,000 that had originally cost $140,000 what is the rate of profit?

3) Farmer Jones sold a parcel of property at 25% profit, which amounted to $48,000. What did the parcel cost him?

4) Property that was purchased for $180,000 later sold at a 15% loss. What was the selling price?

5) A hardware business sold for $120,000 five years after it had been purchased for $150,000. Was the result a profit or a loss and what was the rate?

6) A half-acre lot sold at a 2% loss, which amounted to $1,920. What did the owner pay for the lot originally?

7) Jones paid $160,000 for a piece of investment property and later sold it at 15% profit to a builder. Two years later the builder sold it at a 10% loss. How much did the builder sell it for?

8) A building cost $170,000 and the buyer made improvements of $15,000. After 3 years, it is sold for a 10% profit. What did it sell for?

9) Jones bought a condominium for $220,000 and sold it for a 10% loss to Smith, who later resold it for a 10% profit. What did Smith sell the condominium for?

10) A builder paid $180,000 for a two-acre lot and built a house that cost $120,000. If he wants to realize 15% on his total investment, what must he sell the house for?

Answer Key

Problems

1)	$54,000
2)	$600,000
3)	33 1/3%
4)	60%
5)	$190,000
6)	$212,500
7)	$37,500
8)	$128,000
9)	20%
10)	20%
11)	$190,000
12)	$220,000

Self-Quiz

1)	$20,800
2)	20%
3)	$192,000
4)	$153,000
5)	20% Loss
6)	$96,000
7)	$165,600
8)	$203,500
9)	$217,800
10)	$345,000

18 Return on Investment

When dealing with buyers and sellers in the commercial or income property segment of the real estate field, the broker or salesperson will find that one of the major factors is profitability. Where the residential home buyer is concerned with community, schools, neighborhood, room sizes, and number of baths, the commercial or income property buyer wants to know, "Will it be profitable?" Another way of putting the question is "What will I get back for what I have put in?" or " What will my return on investment be?" We need to look at some of the math steps involved in these types of calculations so we can be prepared to work with buyers and seller asking these questions.

The formula we shall use in solving return on investment problems (R.O.I.) is as follows:

Investment × Rate of Return = Net Income
$$I \times R = N.I.$$

The following terms should be understood:

Investment - the amount of money the buyer puts into the transaction (if not otherwise stated, assume the purchase price equals investment).

Rate of return - comparison net income to investment expressed as an annual percentage.

Net income - income less expenses (expressed annually).

EXAMPLE: An apartment house that sold for $160,000 has an annual return on investment of 12%. What is the annual net income?

Investment = $160,000

Rate of Return = .12   AID $$\frac{N.I.}{I \times R}$$

Net Income = ?

The AID indicates:

$$I \times R = \$160,000 \times .12 = \$19,200 \text{ Net Income}$$

PROBLEMS: 1) What would the net income per year be on a business that cost $200,000 if the rate of return is 9% per year?

2)   If a parcel of commercial property had an R.O.I rate of 11% and cost $240,000, what would the monthly net income be? (annual income divided by 12)

EXAMPLE: A four-family is listed at $375,000. If the net income is $22,500 per year what is the annual rate of return?

Investment = $375,000

Rate of Return = ?   AID $$\boxed{\dfrac{\text{N.I.}}{\text{I} \times \text{R}}}$$

Net Income = $22,500

The AID indicates:

$$\frac{\text{N.I.}}{\text{I}} = \frac{22,500}{375,000} = 375,000\overline{)22,500}^{.06} = 6\% \text{ Return}$$

PROBLEMS: 3)   A vacation cottage is for sale for $190,000. The income after expenses (net income) is projected at $2,375 per month. What would be the annual rate of return on investment?

4)   A three-family house has rents of $1,200 per month each, taxes of $6,000 per year, and other annual expenses of $8,000. If the property were purchased for $365,000, what would be the rate of return?   (Net Income = Total Income - Expenses)

EXAMPLE: What should a buyer pay for two family building if he wants a 15% return on investment and the yearly net income is $45,000?

Investment = ?

Rate of Return = .15

Net Income = $45,000

AID $\boxed{\dfrac{N.I.}{I \times R}}$

The AID indicates:

$$\frac{N.I.}{R} = \frac{45,000}{.15} = .15\overline{)45,000.00}^{\;300000.} = \$300,000 \text{ Investment}$$

PROBLEMS: 5) If an investor wishes to realize 12% on his investment, what should he offer to pay for a business with an annual net income of $48,000?

6) What should a buyer pay for a four-unit apartment building with $800 per month rent from each apartment with yearly expenses of $10,000 if he wants his annual rate of return to be 10%?

EXAMPLE: A) What is the R.O.I. on an investment that is listed at $120,000 if the net income is $14,400 per year?

Investment = $120,000

Rate of Return = ?

Net Income = $14,400

AID $\boxed{\dfrac{N.I.}{I \times R}}$

The AID indicates:

$$\frac{N.I.}{I} = \frac{14,400}{120,000} = 120,000\overline{)14,400.00}^{\;.12} = 12\% \text{ R.O.I.}$$

B)   Using the information from the previous example, what would the return on investment be if the buyer invested $90,000 and obtained bank financing of $30,000? Assume the financing decreased the net income by $1,800 per year for interest expense.

Investment = $90,000

Rate of Return = ?   AID $\boxed{\dfrac{\text{N.I.}}{\text{I} \times \text{R}}}$

Net Income = $12,600
($14,400 - $1,800 Interest Expense)

The AID indicates:

$$\frac{\text{N.I.}}{\text{I}} = \frac{12,600}{90,000} = 90,000\overline{)12,600.00}^{.14} = 14\% \text{ R.O.I.}$$

Note: If the problem does not indicate amount financed, R.O.I. should be figured on total cost. Also note the increase in R.O.I. through the use of financing.

PROBLEMS: 7)   Jones purchased a business for $200,000 with $50,000 cash and $150,000 bank financing. If annual gross income is $25,000 and annual expenses are $15,000:

A)   What is the R.O.I. based on total cost?

B)   What is the R.O.I. based on Jones's investment if the bank financing increases expenses by $6,000 per year?

8)   A farmer has 10 acres of land that net him $600 per acre per year.

A)   What should he pay to get a 5% return on total investment?

B)   How much should he put down of his own money to realize a 20% return on his investment? The interest expense will amount to $150 per month for the portion financed.

EXAMPLE: An appraiser has been asked to establish the capitalization rate of a parcel that has a net income of $8,400. The property was purchased for $140,000 with $100,000 cash and $40,000 bank financing.
(See income approach in Appraisal chapter.)

Note: An appraiser is concerned with total cost or value and does not consider what portion is bank financed. He refers to the R.O.I. rate as a capitalization rate.

Investment = $140,000 (Market Value)

Rate of Return = ? (Capitalization Rate)

Net Income = $8,400

AID $\dfrac{\text{N.I.}}{\text{I} \times \text{R}}$

The AID indicates:

$$\frac{\text{N.I.}}{\text{I}} = \frac{8,400}{140,000} = 140,000\overline{)8,400.00}^{\;.06} = 6\% \text{ Capitalization Rate}$$

PROBLEMS: 9) The net income of a parcel of commercial property is $24,000. If the capitalization rate is 6%, what is the market value of the property?

10) What is the value of $10,000 received as net annual income capitalized at 25%?

Self-Quiz

1) A business is listed for sale for $140,000. If the yearly R.O.I. is 8%, what is the annual net income?

2) What is the annual rate of return on an investment that cost $90,000 if the monthly net income is $450?

3) What was the purchase price of a building with a net income of $36,000 and a return on investment rate of 9%?

4) A farmer bought 80 acres of land at $500 per acre. He paid $10,000 in cash and financed the balance with a local bank. What is his return on his cash investment if the annual net income is $100 per acre?

5) An appraiser has been hired to estimate market value on a building that has a net annual income of $23,400. In his judgment, this type of property should have a capitalization rate of 9%. What is the appraised market value?

6) A business has an 8% rate of return yearly and is for sale for $90,000. At this price, what would be the monthly net income?

7) A business sold for $220,000 and shows an 11% rate of return. If the taxes are $3,000 per year and other expenses are $7,000 per year, what is the annual gross income?

8) A five-unit apartment building is listed at $525,000. If the R.O.I. is 10% and the income from rents is $70,000 per year what are the annual expenses?

9) A six-unit apartment building has monthly rents of $1,000 each. The annual expenses are insurance $3,000, taxes $9,000, utilities $3,600, and the other expenses $7,200. What should an investor pay for the property to realize a 6% R.O.I.?

10) An investment has a capitalization rate of 15% and produces $9,600 net income per year, what would an appraiser estimate as market value?

Answer Key

Problems		Self-Quiz	
1)	$18,000	1)	$11,200
2)	$2,200	2)	6%
3)	15%	3)	$400,000
4)	8%	4)	80%
5)	$400,000	5)	$260,000
6)	$284,000	6)	$600
7)	a) 5% b) 8%	7)	$34,200
8)	a) $120,000 b) $21,000	8)	$17,500
9)	$400,000	9)	$820,000
10)	$40,000	10)	$64,000

19 Taxation

The various levels of government, federal, state, county, city, or town finance their activities through taxes. This may include a wide variety of taxes such as income tax, meals tax, sales tax, gasoline tax, liquor tax, etc. The tax we are most concerned with in dealing with real estate issues is the property tax.

The cities or towns use a tax on real estate as a major source of funds to finance the operations of their local government, such as schools, police and fire protection, public works, and city administration.

Those in the real estate profession need an understanding of how taxes are determined to provide guidance to both buyers and seller in making real estate decisions.

There are two formulas we need to use in working with property tax math:

$$\boxed{\text{Appraised Value} \times \text{Assessment Rate} = \text{Assessed Value}}$$

$$\boxed{\text{Assessed Value} \times \text{Tax Rate} = \text{Annual Tax}}$$

In working with these formulas, the following terms should be understood:
1) **Appraised value** - the market value of property (what it would sell for).
2) **Assessment rate** - the percent of the appraised value (market value) that will be taxed.
3) **Assessed value** - the value that is assigned as a base for determining taxes.
4) **Tax rate** - the amount that will be charged per $1,000 of assessed value as taxes (some states use a mill rate, per $1 of assessed value).
5) **Taxes** - the amount due the city or town (usually expressed on a yearly basis).

Now let us look at the two formulas, one at a time.

Solve for Assessed Value

$$\boxed{\text{Appraised Value} \times \text{Assessment Rate} = \text{Assessed Value}}$$

EXAMPLE: A house is appraised for $250,000. If the assessment rate is 60% of market value, what is the assessed value?

Appraised Value = $250,000

Assessment Rate = .60

Assessed Value = ?

AID $\dfrac{\text{Ass.V}}{\text{App.V} \times \text{Ass.R}}$

The AID indicates:

App. V × Ass. R = 250,000 × .60 = $150,000 Assessed Value

PROBLEM: 1)   A house is appraised at $190,000 market value. If the assessment rate is 80%, what is the assessed value?

Solve for Appraised Value

EXAMPLE: If the assessed value of a piece of property is $56,000 and the assessment rate is 35% of market value, what is the appraised value (market value)?

Appraised Value = ?

Assessment Rate = .35

Assessed Value = $56,000

AID $\dfrac{\text{Ass.V}}{\text{App.V} \times \text{Ass.R}}$

The AID indicates:

$$\frac{\text{Ass.V}}{\text{Ass.R}} = \frac{56,000}{.35} = 56,000.00 \div .35 = 160,000 \text{ Appraised Value}$$

PROBLEM: 2)   If property is assessed at $188,000, what is the appraised value if the assessment rate is 80%?

EXAMPLE: If property is appraised at $196,000 and assessed at $137,200, what is the assessment rate?

Appraised Value = $196,000

Assessment Rate = ?

Assessed Value = $137,200

AID $\dfrac{Ass.V}{App.V \times Ass.R}$

The AID indicates:

$$\frac{Ass.V}{App.V} = \frac{137,200}{196,000} = 137,200 \div 196,000 = 70\% \text{ Assessment Rate}$$

PROBLEM: 3) If property is assessed at $187,200 and has a market value of $208,000, what is the assessment rate?

Solve for Annual Tax

Now let us look at the second property tax formula.

Assessed Value × Tax Rate = Annual Tax

EXAMPLE: If a house is assessed at $120,000 and the tax rate is $20 per $1,000, what are the annual taxes?

Assessed Value = $120,000

Tax Rate = $20 / $1,000

Annual Tax = ?

AID $\dfrac{Ann.Tax}{Ass.V \times TaxR}$

The AID indicates:

$$Ass.V \times TaxR = \$120,000 \times \frac{\$20}{\$1,000} = 120 \times 20 = \$2,400 \text{ Annual Rate}$$

PROBLEM: 4) If the tax rate is $18 per $1,000 for a house that is assessed at
$160,000, what are the monthly taxes?
(Calculate annual tax and divide by 12.)

Solve For Assessed Value

EXAMPLE: What is the assessed value of a home paying $2,700 in yearly taxes if the
tax rate is $15 per $1,000?

Assessed Value = ?

Tax Rate = $15 / $1,000

Annual Tax = $2,700

AID $\dfrac{\text{Ann.Tax}}{\text{Ass.V} \times \text{TaxR}}$

The AID indicates:

$$\frac{\text{AnnTax}}{\text{TaxR}} = \frac{2,700}{15} = 2,700 \div 15 = \$180,000 \text{ Assessed Value}$$

PROBLEM: 5) What is the assessed value of a parcel of property if the tax rate is
$21 per $1,000 and the yearly taxes are $3,570?

Solve For Tax Rate

EXAMPLE: If a house that pays $1,920 per year in taxes is assessed for $64,000, what
is the tax rate?

Assessed Value = $64,000

Tax Rate = ?

Annual Tax = $1,920

AID $\dfrac{\text{Ann.Tax}}{\text{Ass.V} \times \text{TaxR}}$

The AID indicates:

$$\frac{\text{AnnTax}}{\text{Ass.V}} = \frac{1,920}{64} = 1,920 \div 64 = \$30 \text{ per } \$1,000 \text{ Tax Rate}$$

19-4 Taxation

PROBLEM: 6)   A house is assessed for $80,000 and pays $200 per month in taxes, what is the tax rate?

In some cases the problem may require the use of both formulas.

EXAMPLE: If the appraised value of property is $100,000 with an assessment rate of 60% and a tax rate of $40 per $1,000, what are the monthly taxes?

Appraised Value = $100,000

Assessment Rate = .60   AID $\dfrac{Ass.V}{App.V \times Ass.R}$

Assessed Value = ?

The AID indicates:

App. V × Ass. R = 100,000 × .60 = $60,000 Assessed Value

Now that we know the assessed value, we can use the second formula.

Assessed Value = $60,000

Tax Rate = $40 / $1,000   AID $\dfrac{Ann.Tax}{Ass.V \times TaxR}$

Annual Tax = ?

The AID indicates:

Ass. V × Tax R = 60 × 10 = $2,400 Annual Tax

The annual tax is $2,400 but the problem asked for monthly taxes, therefore:

$\dfrac{2,400}{12}$ = $200 Monthly Tax

In case it isn't apparent which formula you should use, merely list both sets of required factors and formula aids. If you have two terms for a formula, solve for the third.

FORMULA 1

Appraised Value

Assessment Rate

Assessed Value

$$\text{AID} \quad \frac{\text{Ass.V}}{\text{App.V} \times \text{Ass.R}}$$

Formula 2

Assessed Value

Tax Rate

Annual Tax

$$\text{AID} \quad \frac{\text{Ann.Tax}}{\text{Ass.V} \times \text{TaxR}}$$

Note: The Assessed Value appears in both formulas. It is necessary to solve one formula to get the assessed value to use in the second formula.

PROBLEM: 7) The market value of a piece of property has been appraised at $130,000. The assessment rate in the town is 60%. If the annual taxes are $2,730, what is the tax rate per $1,000?

8) What is the appraised value of a property in a city that carries a $24.00 per thousand of assessed value for a tax rate and an 80% assessment rate if the taxes are $280.00 per month?

Mill Rate

So far, we have dealt with tax rates that were expressed as dollars per $1,000 of assessed value.

Instead of expressing the tax rate as dollars per $1,000, some locations use dollars per $100, dollars per $10, or dollars per $1 of assessed valuation. When this is done, the tax is still the same but the manner of expressing the rate is slightly different.

The following table will illustrate:

Assessment	Tax Rate	Calculation	Annual Tax
$80,000	$25/$1,000	80 × 25 =	$2,000
$80,000	$2.50/$100	800 × $2.50 =	$2,000
$80,000	$.25/$10	8,000 × .25 =	$2,000
$80,000	.025/$1	80,000 × .025 =	$2,000

When the tax rate is expressed as, .025 per $1, this is referred to as the **mill rate** and can be called 25 mills.

The student should understand the relationship shown in the above table. Then, no matter how the tax rate is given, it can be converted to the method most familiar.

EXAMPLE: What are the annual taxes if the assessment is $50,000 and the tax rate is 42 mills?

42 Mills = .042/$1 of Assessment

= $42/$1,000 of Assessment

PROBLEM: 9)   If the assessed value is $165,000 and the annual taxes are $2,640.

A)   What is the tax rate per thousand?

B)   What is the mill rate?

C)   What is the tax rate per $100 of assessed value?

Self-Quiz

1) Property is appraised at $112,000 and the assessment rate is 90% of market value. What is the assessed value?

2) What is the market value of land that has an assessed value of $49,200 if the assessment rate is 60%?

3) If property with an assessed value of $141,000 has an appraised value of $188,000, what is the assessment rate?

4) Jones bought a piece of property that is assessed for $112,000. If the tax rate is $26.40 per $1,000, what are his yearly taxes? What are his monthly taxes?

5) What is the assessed value of property if the monthly taxes are $220 and the tax rate is $30 per $1,000?

6) If the tax rate is $30 per $1,000, what is the assessed value on a building that pays $2,700 in annual taxes?

7) What is the tax rate per $1,000 for a parcel assessed for $110,000 that pays $6,050 per year in taxes?

8) Smith sold Brown a two-family house with an appraised value of $130,000. The assessment rate is 70% and the tax rate is $21 per $1,000. What are the annual taxes?

9) The yearly taxes on Jones's property are $1,872. If the taxes are based on a tax rate of $26 per $1,000 of assessed valuation and the assessed value is set at 60% of appraised value, what is the appraised value?

10) The market value of a piece of property is $80,000 and the assessed value is based on 75% of the market value. If the taxes are $200 per month, what is the tax rate per $1,000?

Answer Key

Problems		Self-Quiz	
1)	$152,000	1)	$100,800
2)	$235,000	2)	$82,000
3)	90%	3)	75%
4)	$240	4)	$2,956.80
5)	$170,000		$246.40
6)	$30/$1,000	5)	$88,000
7)	$35/$1,000	6)	$90,000
8)	$175,000	7)	$55.00
9)	$16/$1,000, .016/$1(16 mills), $1.60/$100	8)	$1,911
		9)	$120,000
		10)	$40.00

20 Proration and Settlement

The math calculations necessary to determine the dollar amounts on the settlement statement prepared at closing may be of several different types. An item may affect buyer or seller, or both. It may be an adjustment where it is stated (e.g., the buyer owes the seller $100 for a refrigerator), or there may be some calculation needed to determine the dollar amount (e.g., the tax stamps due at $2.28/$500 of selling price times the actual sell price).

One additional type of adjustment is called proration. You prorate something when expenses or income must be divided between buyer and seller as of the date of passing (e.g., property tax, insurance, or rents).

In this chapter, we shall look at the math necessary to calculate each one of these types. When deciding whether an amount should be a debit or a credit on the settlement statement, it may be helpful to remember **debit** or **credit** as **from** or **to** the party affected. An amount paid to the seller would be a credit to the seller. Four separate steps should be used:

1) Calculate the amount of money involved.
2) Who is affected...buyer, seller or both?
3) Is the money coming from or to them?
4) Make entry on the settlement statement.

(Note: For the following three examples see the settlement statement after Example 3 for the solutions.)

EXAMPLE 1: The buyer owes $750 for the title examination fee.
    1) Calculate the amount involved - $750.00
    2) Who is affected - Buyer
    3) Is the money coming from or to him - From.
    4) Make the entry - $750.00 from (debit) the buyer.

EXAMPLE 2: The seller owes $820.80 in excise tax stamps.
    1) Calculate the amount involved - $820.80
    2) Who is affected - Seller.
    3) Is the money coming from or to him - From.
    4) Make the entry - $820.80 from (debit) the Seller.

EXAMPLE 3: The buyer owes the Seller $60.00 for fuel oil left in the tank.
    1) Calculate the amount involved - $60.00
    2) Who is affected - Buyer and Seller.
    3) Is the money coming from or to him - From (debit) the buyer to (credit) the seller.
    4) Make the entry - $60.00 from (debit) buyer and $60 to (credit) seller.

	Buyer		Seller	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)
Example 1: Title Examination Fee	$750.00			
Example 2: Tax Stamps			$820.80	
Example 3: Fuel Adjustment	$60.00			$60.00

PROBLEM: 1) Take the following adjustments and enter them on the settlement statement.

A) Buyer owes fee for recording new deed and mortgage $50.00.

B) Seller owes fee for discharging old mortgage $20.00.

C) Buyer owes seller $120 for refrigerator.

	Buyer		Seller	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)
A)				
B)				
C)				

Proration

Some of the adjustments at settlement involve calculating expenses that one party owes the other as of the day of settlement. These adjustments are called prorations. The proration may be to the advantage of either buyer or seller depending on the circumstances. The most common items that may require prorating are taxes and rents.

Taxes

EXAMPLE: Jones is buying a house from White and settlement is taking place on January 15. The taxes were paid by White to the city for the year ending in December. The annual taxes are $2,880.

Note: In calculating prorations, the seller is responsible for expenses up to and including the day of settlement.

1)   Calculate the amount involved - number of days × daily rate
   $(15 \times \$8 = \$120.)$
   Number of days - seller is responsible up to and including passing date
            = 15 days.
   Daily rate - $2,880 divided by 360 days = $8/day
          or $2,880 divided by 12 months = $240
          $240/month divided by 30 days/month = $8/day.

2)   Who is affected - buyer and seller.
3)   The money coming from or to - From the seller to the buyer.
4)   The entry - $120 from (debit) the seller and $120 to (credit) the buyer.

	Buyer		Seller	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)
Property tax adjustment		$120.00	$120.00	

PROBLEM: 2)   A buys a house from B on November 15. The seller had already paid the taxes through the end of the year. This means that 1-1/2 months of property tax should be adjusted. If the annual taxes are $1200, what is the settlement statement entry?

	Buyer		Seller	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)

Rents

When the property being sold is income property, there is almost always a rent adjustment to be made. It is highly unlikely that all tenants have paid their rents up to the exact day of settlement, no more or no less. The adjustment must be figured for each apartment separately as they may each differ in amount of rent, date rent is paid, and whether or not the rent is overpaid or underpaid as of the settlement date.

EXAMPLE: A two-family is being sold with settlement to take place on November 20. The first floor tenant pays $540 per month and has paid through November. The second-floor tenant pays $480 per month and has paid through October. He has not paid his November rent yet. Assume the buyer will be collecting the November rent from the second floor tenant. What is the rent adjustment due at settlement?

Rental Unit 1:
1) Calculate the amount involved - number of days × daily rate
   = 10 days × $18.00 = $180.00
2) Who is affected - buyer and seller.
3) The money coming from or to - from the buyer to the seller.
4) The entry (wait until Unit 2 is figured).

Rental Unit 2:
1) Calculate the amount involved - number of days × daily rate
   = 20 days × $16.00 = $320.00
2) Who is affected - buyer and seller.
3) The money coming from or to- from the buyer to the seller.
   (When the tenant does not pay his rent, the full month will be received by the buyer; therefore the buyer pays the seller now).
4) The entry (wait until Unit 1 and 2 are combined):

Rental Unit 1 - Seller owes Buyer	$180.00
Rental Unit 2 - Buyer owes Seller	$320.00
Net Effect - Buyer owes Seller	$140.00

The entry therefore is $140.00 from (debit) buyer and $140 to (credit) Seller.

	Buyer		Seller	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)
Rent adjustment	$140.00			$140.00

PROBLEM: 3) A two-family house is being sold with settlement to take place on June 6. The buyer will occupy the first floor which is now vacant. The second-floor tenant pays $570 per month and has paid through June. The seller is holding a $570 security deposit which should be turned over to the buyer at passing. What should the adjustment be?

	Buyer		Seller	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)

Proration Self-Quiz

What should the settlement adjustment be for the following problems? Use the settlement statement worksheet on the following page to show the answers. The solution is at the end of the chapter.

1) The buyer owes the bank a $200 mortgage application fee.
2) The seller owes the bank attorney $50 for preparing the deed.
3) There is a $20 fee for recording a second mortgage.
4) The broker's fee is 6% of the $93,000 sell price.
5) The pay-off figure on the existing mortgage is $14,350.
6) The dining room set is being sold for $200.
7) The bank is granting a $64,000 first mortgage.
8) The annual taxes are $1,200 and were paid through June. The passing is at the end of September.
9) A garage on the property is rented at $40 per month and the tenant has prepaid through the calendar year. The closing is set for October 31st.
10) A three-family house has tenants who pay rent as follows:

Tenant 1 - $690.00 per month.
Tenant 2 - $690.00 per month.
Tenant 3 - $600 per month.

They all pay their rent on the first of each month. The settlement date is September 20. Tenant 1 and 2 have paid through September. Tenant 3 has not paid September rent as yet. Assume the new owner will collect any late rental payments.

Proration Worksheet

Settlement Date:		Buyer's Statement		Seller's Statement	
		Debit (from)	Credit (to)	Debit (from)	Credit (to)

Proration Answer Key

Settlement Date:	Buyer's Statement		Seller's Statement	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)
Problem 1 A) Recording fee	$50.00	$	$	$
B) Discharge fee			20.00	
C) Purchase refrigerator	120.00			120.00
Problem 2 Property tax adjustment	150.00			150.00
Problem 3 Rental adjustment		1,026.00	1,026.00	
SELF-QUIZ				
1) Mortgage application fee	200.00			
2) Deed preparation			50.00	
3) Recording fee (2nd mortgage)	20.00			
4) Broker's fee			5,580.00	
5) Mortgage pay off			14,350.00	
6) Dining-room set	200.00			200.00
7) First mortgage		64,000.00		
8) Property tax proration		300.00	300.00	
9) Rent proration		80.00	80.00	
10) Rent proration		60.00	60.00	

Settlement

In the day-to-day practice of real estate, brokers and salespeople will be listing property and preparing purchase and sale agreements. As part of this activity, it is necessary to develop the ability to prepare the initial forms, as well as the ability to interpret them once they have been formalized. In Real Estate chapters five and eight, you will find a treatment of contracts and listing agreements respectively. In this section we will concern ourselves with a settlement statement.

Real estate professionals also need to be capable of advising both buyers and sellers as to what their respective expenses are at the passing of papers. Who pays for what? Therefore, a knowledge of settlement statement preparation and analysis is especially helpful for both brokers and salespeople.

Local REALTOR ® boards and individual real estate offices will recommend the use of specific forms. The closing is also covered by RESPA (Real Estate Settlement Procedures Act) which requires that most new first mortgages conform to certain requirements and specific forms. In this chapter we use a simplified form for the settlement statement for illustrative purposes. Although the RESPA form serves the same purpose as our form does here, it is much more complicated.

The following is a problem in which you can practice the skill necessary to complete a settlement statement. The settlement statement is actually a list of the individual prorations, adjustments, and other costs incurred by either party that we have just learned. To complete the settlement between buyer and seller, all that needs to be done is to total the columns and find the difference between debits and credits on each side of the statement.

On the buyer's side of the statement there will be more debits (amounts coming from) than credits (amounts going to the buyer). Therefore, the difference represents the amount the buyer has to show up with in order to pass papers. The seller's side will usually have more credits than debits. The difference between these two columns represents the amount of funds to be received in excess of payments and other expenses which is called the **seller's proceeds**.

Settlement Problem

From the following hypothetical situation, sort out the figures needed to complete a settlement statement and fill out the blank statement sheet that follows:

You are a salesperson for XYZ Realty and on January 6 you listed a house at 17 Main Street in the city of Downtown, Massachusetts. The listing price was $260,000 and you are to receive a 6 percent commission on the selling price.

The house and property is assessed for $220,000 and the town has a tax rate of $15 per thousand of assessed valuation. The seller also owes the town a $2,600 sewer assessment charge for the new city sewerage system installed in the street last summer which would have to be paid at the closing.

On February 2 you show the house to a young couple who really like the area and want to make an offer. The prospective buyers offer $248,000 for the house and $1,000 for the refrigerator, stove, washer and dryer. The seller does not accept this offer but counteroffers with $256,000 plus $1,000 for the appliances. The buyers feel this is still a bit high and makes another offer $252,000 which is to **include** all appliances.

The owners of the property accept the $252,000 offer and agree to let the appliances stay as part of the purchase price. The buyers, shown to be strong, are putting a down payment of 30 percent of the purchase price on the property and intend to finance the rest at current rates for thirty years. The buyers also submitted a $15,000 deposit to be held in escrow until passing of papers.

At the March 15 closing, the sellers are required to pay off their existing mortgage. The bank has calculated this figure to be $80,000. Real estate taxes have been paid through the last calendar year. Tax stamps are $2.28 per $500 of selling price.

Other expenses include: title examination and attorney fees for the paperwork and recording of documents ($800), deed preparation ($75), one point to be paid by buyer on the amount financed. The bank also required the buyer to pay $150 for a plot plan and $200 for the appraisal report, a $20 fee for the discharge of the old mortgage, and $120 adjustment for heating fuel remaining in the tank.

Prepare as much of the settlement statement as possible before looking at the solution.

Settlement Worksheet

Settlement Date:		Buyer's Statement		Seller's Statement	
		Debit (from)	Credit (to)	Debit (from)	Credit (to)

Settlement

Settlement Date:	Buyer's Statement		Seller's Statement	
	Debit (from)	Credit (to)	Debit (from)	Credit (to)
Selling Price	$252,000.00	$	$	$252,000.00
Deposited in Escrow		15,000.00		
New 1st Mortgage		176,400.00		
Old 1st Mortgage			80,000.00	
Tax Stamps			1,149.12	
Broker			15,120.00	
Sewer Assessment			2,600.00	
Real estate Tax		687.50	687.50	
Attorney	800.00			
Deed Preparation			75.00	
Points	1,764.00			
Plot Plan	150.00			
Appraisal	200.00			
Mortgage Discharge			20.00	
Fuel	120.00			120.00
	255,034.00	192,087.50	99,651.62	252,120.00
Due from Buyer		62,946.50		
Due to Seller			152,468.38	
Totals	255,034.00	255,034.00	252,120.00	252,120.00

21 Commissions

The approach to solving commission problems is basically the same as the other Base × Rate = Percentage problems that we have done in other chapters. The two new concepts we will consider are 1) commission split between offices or between individuals within the same office, and 2) calculating sell price when a seller wants to clear a certain net figure after commission.

The formula we will use in solving commission problems is:

$$\text{Sell Price} \times \text{Commission Rate} = \text{Commission}$$
$$SP \times R = C$$

The following terms should be understood:

Sell price - the dollar value a buyer pays for property.

Commission rate - the broker's fee expressed as a percent of the sell price.

Commission - the broker's fee in dollars.

EXAMPLE: A condo sells for $208,000 and the broker's commission is 6%. What is the amount of the commission?

Sell Price = $208,000

Rate = .06   AID $\dfrac{C}{SP \times R}$

Commission = ?

The AID indicates:

SP × R = $208,000 × .06 = $12,480 Commission

PROBLEM: 1) What would the commission be on a lot of land that sold for $127,000 if the real estate fee is 7%?

EXAMPLE: What did a house sell for if the real estate fee was 6% and the commission amounted to $17,100?

Sell Price = ?

Rate = .06   AID $\dfrac{C}{SP \times R}$

Commission = $17,100

The AID indicates:

$$\frac{C}{R} = \frac{17,100}{.06} = 285,000 \text{ Sell Price}$$

PROBLEM: 2)   If the rate of commission is 7% and the broker's fee was $12,950, what did a building lot sell for?

EXAMPLE: If a parcel of property sold for $110,000 and the commission was $5,500, what percentage was the commission of the sell price?

Sell Price = $110,000

Rate = ?   AID $\dfrac{C}{SP \times R}$

Commission = $5,500

The AID indicates:

$$\frac{C}{SP} = \frac{5,500}{110,000} = 5\% \text{ Commision Rate}$$

PROBLEM: 3)   An apartment building sold for $360,000. If the broker received $23,400, What was his rate of commission?

21-2 Commissions

EXAMPLE: Two real estate offices co-broked on a 50-50 split on a house that sold for $240,000. If the fee was 6%, what did each agency receive?

Sell Price = $240,000

Rate = .06   AID $\dfrac{C}{SP \times R}$

Commission = ?

The AID indicates:

$SP \times Rate = \$240,000 \times .06 = \$14,400$ Total Commission

Each agency received 50% of the fee. Therefore, they each received

$\dfrac{14,400}{2} = \$7,200$ each

PROBLEM: 4)   A home sold through the Multiple Listing Service (M.L.S.) for $310,000 with a 7% broker's fee. If the fee arrangement was 60-40, with 60% going to the selling office, how much did the listing office receive?

EXAMPLE: A seller wants to net $180,000 after a real estate commission of 7%. What should the property be advertised at (to the nearest dollar)?

This problem is a little different. In the formula $SP \times R = C$, we only know R = 7%. However, if

$SP \times 7\% = $ Commission

we know

$SP \times 93\% = $ Net to Seller

Then we have a new formula, $SP \times $ Net Rate = Net Amount.

AID $\dfrac{Net}{SP \times Net\ R}$

The AID indicates:

$\dfrac{180,000}{.93} = 193,548$ Sell Price

PROBLEM: 5)   What should a house sell for to net a seller $300,000 after a 6% commission (to the next higher $500 figure)?

Self-Quiz

1) A building was sold for $410,000. If the broker's fee was 6% of sell price, what was the amount of the commission?

2) Jones Realty charged 7% commission on a $194,000 sale, how much did the seller receive?

3) What was the sell price of a condo if the agent charged 6% and received $15,600?

4) If a real estate office charges 8% commission rate and received $13,200 for selling a piece of property, what was the sell price?

5) A landowner wishes to sell some woodland he owns. What should the property be listed at if he wishes to net $108,000 after the broker's fee of 10%?

6) Two offices co-broked on a 50-50 basis in selling a home for $335,000. The commission was 6%. The listing salesperson received 20% of the commission received by his office. What did he receive as a listing fee?

7) A house sold for a 6% commission rate. The listing and selling broker split the commission equally and each received $16,500. What was the selling price of the house?

8) A condominium sold for $240,000. The broker received 6% on first $100,000 and 4% for everything above $100,000. What was the total commission?

9) A listing fee of 10% of the total commission was paid to salesperson A. The selling salesperson and the broker who owned the agency divided the commission on a 50-50 basis after deducting the listing fee. If the condo sold for $180,000 and the rate was 6%, what did the selling salesperson receive?

10) A listing fee of 10% of the total commission was paid to salesperson A. The selling salesperson and the broker who owned the agency divided the commission on a 50-50 basis. The listing fee is deducted from the selling salesperson's share. If the condo sold for $180,000 and the rate was 6%, what did the selling salesperson receive?

Answer Key

Problems

1) $8,890
2) $185,000
3) 6.5%
4) $8,680
5) $319,500

Self-Quiz

1) $24,600
2) $180,420
3) $260,000
4) $165,000
5) $120,000
6) $2,010
7) $550,000
8) $11,600
9) $4,860
10) $4,320

22 Depreciation

Before we approach depreciation math problems and how to solve them, we should discuss some of the basic concepts of what depreciation is and how it affects those in the real estate field.

Depreciation is a reduction (decrease) in value. If you bought a car last year for $11,000 and today it is worth $9,000, the car has depreciated by $2,000.

Appreciation is an increase in value. If you bought an antique clock last year for $1,000 and this year it is worth $1,500, your clock would have appreciated $500.

In dealing with real estate issues, the IRS does not allow the land itself to depreciate. Only the buildings or other improvements depreciate. Many of the issues involving depreciation will be influenced by the Internal Revenue Service regulations and what the government will allow for tax purposes. This affects how an accountant will keep financial records.

For example, an investment that costs $75,000 five years ago may now be worth $125,000 in market value. However, tax laws may allow us to depreciate the building in our records by $3,750 per year times five years or $18,750 from our original $75,000 cost. Therefore, our building would show on our accounting books as being worth $56,250 even though it would sell for $125,000 at current market value.

Depreciation concerns itself with reduction in value from original cost and not with current value.

The following terms should be understood:

Depreciation - a reduction (decrease) in value.

Appreciation - an increase in value.

Useful life - the number of years an asset will last before needing replacement.

Accrued depreciation - total depreciation to date (yearly depreciation times number of years)

Book value - value remaining after depreciation (original cost minus accrued depreciation)

EXAMPLE: A building cost $120,000 and has a useful life of 20 years.

Original Cost = $120,000
Useful Life = 20 years
Depreciation = $6,000/year ($120,000 divided by 20 years)

After one year, what is the accrued depreciation and book value?

Original Cost   = $120,000
Depreciation   = - $6,000
Book Value   = $114,000

Type of Depreciation

What we have just illustrated is called straight line depreciation. All that means is that we depreciate the same amount each year over the useful life of the item. In this case, we depreciated $6,000 each year over the 20-year useful life of the building.

There are other depreciation methods that allow different amounts of depreciation each year over the useful life. We do not need to get into those types for our purposes. Straight line depreciation will be used.

The formula we shall use in solving depreciation problems is as follows:

$$\boxed{\begin{array}{c} \text{Cost} \times \text{Depreciation Rate} = \text{Depreciation} \\ C \times DR = D \end{array}}$$

Note: Depreciation rate will be the yearly rate times the number of years.

EXAMPLE: A machine cost $10,000 and has a useful life of 5 years. What is the accrued depreciation after 2 years?

Cost = $10,000
Depreciation Rate = 40% (5 years =100%, 1 year = 20% × 2 years = 40%)

Depreciation = ?

$$\text{AID} \quad \boxed{\dfrac{D}{C \times DR}}$$

The AID indicates:

C × DR = $10,000 × .40 = $4,000 Accrued Depreciation

PROBLEMS: 1) A building cost $100,000 and has a useful life of 10 years. What is the depreciation after 3 years? What is the remaining book value?

2) A company car cost $9,000 and has a useful life of 3 years. What is the annual depreciation, annual depreciation rate and accrued depreciation after 2 years?

EXAMPLE: A machine cost $8,000 and has a useful life of 4 years.   If it has depreciated $6,000, what rate has it depreciated?   What is the annual rate of depreciation?

Cost = $8,000

Depreciation Rate = ?

Depreciation = $6,000

AID $\dfrac{D}{C \times DR}$

The AID indicates:

$$\frac{D}{C} = \frac{6,000}{8,000} = 75\% \text{ Depreciation Rate}$$

If 4 years of useful life = 100% depreciation, one year = 25% Annual Depreciation.

PROBLEMS: 3)   A building cost $140,000 and has a useful life of 20 years. What is the depreciation per year in dollars and percent?

4)   A machine cost $15,000 and has a book value of $10,000. What is the depreciation in percent? (Note: Cost - Depreciation = Book Value)

EXAMPLE: If a building has depreciated $16,000, which amounts to 20%, what was the original cost?

Cost = ?

Depreciation Rate = 20%

AID $\dfrac{D}{C \times DR}$

Depreciation = $16,000

The AID indicates:

$$\frac{D}{DR} = \frac{16,000}{.20} = \$80,000 \text{ Original Cost}$$

PROBLEMS: 5) A building depreciates at 6% per year or $4,200 per year. What was the original cost?

6) If a machine depreciates at 5% per year, after how many years will the book value be 30% of original cost?

EXAMPLE: If land appreciates 10% per year, how much does an acre appreciate in 4 years if it cost $60,000

$$\boxed{\begin{array}{c} \text{Cost} \times \text{Appreciation Rate} = \text{Appreciation} \\ C \times AR = A \end{array}}$$

Cost = $60,000

Appreciation Rate = 40%   AID $\boxed{\dfrac{A}{C \times AR}}$

   (10% per year × 4 years)

Appreciation = ?

The AID indicates:

$C \times AR = \$60,000 \times .4 = \$24,000$ Appreciation

PROBLEMS: 7) A lot that cost $75,000 when bought 2 years ago has appreciated 15%. What is it worth today?

8) If a lot that cost $90,000 has appreciated $18,000 after 2 years, what is the annual appreciation (in percent)?

EXAMPLE: Jones bought a parcel for $80,000. The building was worth $60,000 and the land worth $20,000. If the building depreciated at 5% per year and the land appreciated at 10% per year, what was the parcel worth after 3 years?

Building: AID $\boxed{\dfrac{D}{C \times DR}}$

The AID indicates: $C \times DR = \$60,000 \times .15$

            $.05 \times 3 \text{ years} = \$9,000 \text{ Depreciation}$

Land: AID $\boxed{\dfrac{A}{C \times AR}}$

The AID indicates: $C \times AR = \$20,000 \times .30$

            $.10 \times 3 \text{ years} = \$6,000 \text{ Appreciation}$

	Original Cost	Dep./Apprec.	New Value
Building	$60,000	- $9,000	= $51,000
Land	$20,000	+ $6,000	= $26,000
			$77,000 Total Value

PROBLEMS: 9)   Smith paid $72,000 for a building valued at $60,000 on a lot worth $12,000. If the land appreciated 7% per year and the building had a useful life of 10 years, what was the value of the parcel after 2 years?

10)   A parcel sold for $108,000. The lot was worth $18,000. If the land did not appreciate at all and the building had a useful life of 20 years, what is the value of the parcel after 5 years?

Self-Quiz

1) A machine cost $18,000 and has a useful life of 10 years. What is the annual depreciation?
2) In the previous problem, what would be the book value after 6 years?
3) A building cost $100,000 and has a book value of $60,000. What is the depreciation in percent?
4) What was the original cost of a parcel that has depreciated 20% and is now worth $64,000?
5) Brown paid $200,000 for an apartment complex. Of the $200,000 the land was valued at $60,000. If the land appreciated 5% per year and the building has a useful life of 20 years, what was the value of the parcel after 10 years?

Situation: An asset cost $120,000 and has a useful life of 25 years.

6) What is the depreciation rate per year?
7) What is the depreciation per year?
8) What is the total percent depreciation after 3 years?
9) What is the accrued depreciation after 3 years?
10) What is the book value after 3 years?

Answer Key

Problems		Self-Quiz	
1)	$30,000, 70,000	1)	$1,800
2)	$3,000; 33 1/3%, $6,000	2)	$7,200
3)	$7,000; 5%	3)	40%
4)	33 1/3%	4)	$80,000
5)	$70,000	5)	$160,000
6)	14 years	6)	4%
7)	$86,250	7)	$4,800
8)	10%	8)	12%
9)	$61,680	9)	$14,400
10)	$85,500	10)	$105,600